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Interaction of an atom subject to an intense laser field with its own radiation field and nonlocality of electromagnetic interaction

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Abstract

We discuss the interaction of an atom subject to an intense driving laser field with its own radiation field. In contrast to the states of bare atoms, the energy difference between some dressed states with the same total angular momentum, its projection and parity may be very small. The self-interaction of a combined atom-laser system associated with nonradiative transitions between such states is effectively strong. We show that the contribution to the radiative shift of the sidebands of the Mollow spectrum, which comes from such processes, is very significant and may be much larger than the trivial Lamb shift, which is the simple redistribution of the Lamb shifts of the corresponding bare states. In the final part, we discuss the possibility that in the Mollow spectrum nonlocality of electromagnetic interaction, which in other cases is hidden in the regularization and renormalization procedures, can manifest itself explicitly.

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